

CENTRE FOR ECONOMIC RESEARCH

WORKING PAPER SERIES

2004

Grain Prices and Mortality: A Note on La Michodière's Law

Jean-Michel Chevet, INRA-CORELA-CRH, Paris
and Cormac Ó Gráda, University College Dublin

WP04/01

January 2004

**DEPARTMENT OF ECONOMICS
UNIVERSITY COLLEGE DUBLIN
BELFIELD DUBLIN 4**

*GRAIN PRICES AND MORTALITY:
A NOTE ON LA MICHODIÈRE'S LAW¹*

Jean-Michel Chevet,
(INRA-CORELA-CRH, Paris)
email: Jean-Michel.Chevet@ivry.inra.fr

&

Cormac Ó Gráda
University College, Dublin
Email: ograda@princeton.edu

¹ Our thanks to George Grantham and to Antoin Murphy for helpful comments on an earlier draft and to David Weir for sharing his French price data with us.

ABSTRACT

Research linking food prices and excess mortality has a long history in applied economics and economic history. It goes back to 1766, when Jean-Baptiste de la Michodière was the first to use empirical data to argue for a positive association between wheat prices and mortality. Here La Michodière's time series are subjected to closer statistical scrutiny: the correlation survives, though it is less strong than some later scholars asserted. We also test for the price-mortality link using cross-section data for the 1690s and 1700s.

KEYWORDS: food prices, famine, economic history, history of economic thought

*GRAIN PRICES AND MORTALITY:
A NOTE ON LA MICHODIÈRE'S LAW*

The association between high food prices and excess mortality is a common theme in pre-industrial demographic history. In the 1980s it was the focus of Ronald Lee's contribution to Wrigley and Schofield's classic *Population History of England* and David Weir's much-cited comparative studies of demographic regimes in pre-industrial England and France (Lee 1981; Weir 1984). Both these studies applied econometric techniques to the analysis of the short-run impact of one (necessarily rather crude) measure of living standards -- changes in the price of wheat relative to a measure of the nominal wage -- on mortality and fertility rates. Such research is in a tradition dating back through Thomas Robert Malthus at least as far as the 1760s in France (Meuvret 1946; Malthus 1800).

In 1766 the political arithmetician Louis Messance, dubbed the 'true father of French demography' by Joseph Spengler (1940: 94)¹, produced the volume that would be his lasting claim to fame, *Recherches sur la population des généralités d'Anvergne, de Lyon, de Rouen, et de quelques provinces et villes du royaume*.² It appeared at a time when 'most authors...whose work had been published in recent years...had asserted that the kingdom was losing population...without offering any supporting evidence' (Messance 1766: preface). Foremost among these authors was the Marquis de Mirabeau, whose *L'ami des hommes, ou traité sur la population* had appeared in 1756. Messance produced a range of demographic data from many different parts of France -- 'for one-tenth of the Kingdom' -- to scotch

such a claim. These data, ‘carefully put together and simply presented...dissipated errors and became established facts’ (Messance 1788: 1).³

In addition – and this is what interests us here – a postscript to *Recherches sur la population* claimed, on the basis of a systematic analysis of real data, that there was a positive relationship between mortality and the price of wheat. Both the *Recherches* and the postscript combine analysis and polemics. The postscript, ‘*Des Réflexions sur la valeur du bled*’, is in effect a critique of the argument that high grain prices offer the best guarantee against idleness and indolence.

But was Louis Messance the author of the postscript? In another work published over two decades later (Messance 1788) he wrote (our translation):

Mr. Smith, in his book *The Wealth of Nations*, seems to have based his appraisal of me on the ‘Reflections on the price of wheat’, printed at the back of *Recherches sur la Population*, published in 1766. But I must point out that these ‘Reflections’ are not my work (*Je dois dire que ces Réflexions ne sont point à moi*).

Messance was indeed invoked by Smith in *The Wealth of Nations* as ‘a French author of great knowledge and ingenuity’, and referred to elsewhere as ‘the most judicious author of them all’⁴ (Smith 1976: 102, 216, 257). High praise indeed! But if we take Messance at his word, then the most likely author of ‘*Des réflexions*’ is Jean-Baptiste François de la Michodière (1720-1797), Messance’s mentor and employer in the 1750s and 1760s. Indeed, long ago others credited La Michodière with authorship of part of the *Recherches* (Coquelin 1852: II, 158; Brian and Théré 1998: 44-47), and it is surely more than a coincidence that the case-

studies highlighted in '*Des réflexions*' trace La Michodière's career-path in the 1750s and 1760s, from Paris-based 'président du Grand Conseil' in 1750 to *intendant* of Riom (Auvergne) in 1753, of Lyons in 1757-62, and of Rouen in 1762-68.

In what follows we assume that La Michodière was the author of '*Des réflexions*'. There he reported annual mortality and price data for Paris, Rouen, Lyon, Clermont-Ferrand (located a short distance from Riom), and London, and tabulated them by years of high and low prices. The price data refer to wheat; the mortality data refer to municipal institutions (*hôpitals-dieu*) that catered for the sick urban poor. He found that in years of high wheat prices mortality also tended to be high, and conversely for years of low prices. For example, he showed that in the four years with the highest mortality in Paris between 1744 and 1763, the average price of wheat was £19 1s 3d, while in the four years with the lowest mortality it was £14 18s 5d (Messance 1766: 311). His numbers, he claimed, 'all proved, in the most convincing fashion, that years of high prices were also those of highest mortality and ill-health' (1766: 291). This generalization might be dubbed La Michodière's 'law'. Moreover, hospitals were fullest in the same years and their inmates more likely to perish, with the inevitable consequence that the better off and the wealthy were at greater risk of contracting infectious diseases (1766: 291-2). La Michodière's main target in this section of *Recherches* was the Physiocratic assertion that high grain prices were good for the economy. On the contrary, he argued: cheap grain meant well nourished and contented labourers and more purchasing power left over to spend on other goods.⁵

La Michodière's vicarious influence on French historiography would prove enduring. This is elegantly documented by Cabourdin (1988). He cites François

Melier, who posited an even tighter correlation between the two time series on the basis of La Michodière's data, writing in 1841 that 'whenever the price of wheat rose, mortality increased...and whenever it fell, mortality also fell.' Likewise A. Legoyt, who, a little later, again on the basis of La Michodière's data, stated: 'Under the influence of (high prices), one sees mortality rising, marriages diminishing or becoming less fertile, and movements of population taking place'. Cabourdin also notes how Jean Meuvret, Pierre Goubert, and others lent their considerable prestige to the same tradition, but he leaves the last word to George Livet, who summed up this literature in 1963 with the pithy phrase, '*la mercuriale sécrète la mortalité*' (all citations in Cabourdin 1988: 180-81).

(I) *Mortality and Price*

Given its enduring influence, it is worth noting that the statistical relationship between mortality and price in La Michodière's data is much looser than might be imagined. In all cases the data cover a forty-year period, but the French data refer to 1723-1762 while the London data are for 1714-1753. The estimates refer to both first differences and proportionate rates of change. Regressing the proportionate rates of change in mortality on the proportionate change in price of wheat gives the results reproduced in Table 1. In Paris a doubling in price would mean a 17 per cent rise in mortality, whereas in Lyons it would have resulted in a 12.1 per cent rise in mortality over the same period. In Clermont-Ferrand the predicted rise in mortality is much higher -- 34.5 per cent -- but this estimate is rather weakly determined. Note that these elasticities refer not to the mortality of the population as a whole, but to that of the poor. The death

rates in the Hôtel-Dieu supplying the mortality data were very high, even in normal years (e.g. Coury 1969: 36-38). In London, where mortality is measured by civil bill data and therefore refers to the entire population, the elasticity lies between those for Paris and Lyons, though again the estimate is not very robust.

(II) *Mortality, Morbidity, and Price*

La Michodière also included morbidity data from the Hôtel-Dieu in Lyons and in Paris. Interestingly, the elasticities of mortality relative to morbidity are almost identical in both cases, 1.12 for Paris versus 1.14 for Lyons (Table 2). In other words, a ten per cent in the number of ill inmates produced on average rise of about eleven per cent in the number of deaths. These coefficients are much better determined than those in Table 1. The impact of wheat price on morbidity was twice as strong in Lyons as it was in Paris, at least to judge by Hôtel-Dieu admissions (the respective elasticities being 0.244 and 0.127).

III. *A Cross-sectional Perspective.*

Part of the reason for the rather weak relationship between mortality and price implied by La Michodière's data is that not all mortality crises were subsistence crises: infectious diseases such as smallpox or typhoid fever might produce mortality peaks only weakly related to the food supply. This prompts a look at cross-section evidence in famine years. As David Weir (1989) and others have shown, grain markets during the *ancien régime* were segmented by distance and poor communications.⁶ The spatial variation in wheat prices cannot be known

precisely, but surviving data suggest a coefficient of variation of about 0.3 across the hexagon in the late seventeenth and early eighteenth centuries. There is evidence too that during crises the rises in grain prices were by no means uniform (Ó Gráda and Chevet 2002: 720-22). Here we look at the increases in the price of wheat in some forty-five markets during two famines that devastated France toward the end of Louis XIV's reign, those of 1693-4 and 1709, and compare them with excess mortality in the relevant *départements*. Those major crises are described in some detail in Lachiver (1991); how elites and markets functioned in conditions of crisis are discussed in Grantham (1997) and Ó Gráda and Chevet (2002). How strong was the correlation between price increases and excess mortality?⁷ Before answering this question, some limitations of the data must be noted.

First, and probably most serious, some of the mortality estimates are derived from a very slender sample base. Data kindly supplied by the Institut National d'Études Démographiques (INED)⁸ from its ongoing inquiry into population trends in pre-revolutionary France allow us to track these crises region by region. The INED project, like that which produced the Cambridge Group's estimates of the pre-censal population of England, is based on counts of literally millions of records extracted from parish registers across the hexagon. While based on a large sample of parishes, these data nevertheless have their limitations and must be handled with care. They still require further refinement and correction.⁹ The estimates refer to *départements*, an administrative unit devised nearly a century after the events discussed here. In several *départements* the lack of data means that the estimates of births, marriages, and deaths stem from very

small non-random samples of parish registers. In nine cases¹⁰ the *départementale* estimates are based on either two or three parishes; in the case of Haute-Savoie only one usable register survives (Séguy, 1998: 198-204). Urban populations present particular problems. Moreover, many seventeenth-century registers suffer from omissions and gaps (Bonneuil, 1998), and a considerable under-registration of deaths, particularly those of infants and children. There is no sure way of knowing whether under-recording was more serious in crisis years. Nevertheless, the INED database casts new light on what has been hitherto a ‘demographic dark age’. For the purposes of this paper we have plugged a few minor gaps in the dataset by simple interpolation, but we have not interfered otherwise with the numbers in the INED series.

Though it is obvious that the database is too thin to allow precise, reliable tracking of year-to-year fluctuations at the *département* level, nonetheless it reveals some interesting patterns for the famine years. We define the mortality toll in 1693-4 as the proportionate change in deaths in 1693 and 1694 over the annual average for the 1680-92 period. The outcome suggests that west of an imaginary line from Bordeaux to Le Havre, south of a line from Carcassonne to Geneva, and east of a line from Geneva to Lille, the impact of the disaster on baptisms and burials was relatively minor. By this reckoning excess mortality was highest in today’s southwestern *départements* of Landes, Lot-et-Garonne, Gers, Cantal, and Lozère, and (rather anomalously) in the northern *département* of Nord.¹¹ In these *départements* estimated excess mortality in 1693-4 was over four times that in a typical pre-famine year. By contrast, in *départements* such as Finisterre and Côtes-du-Nord in the west, Var in the south, and Moselle in the east, the INED dataset

suggests that mortality was less than the norm in 1693-4.

In the case of 1709-10 excess mortality is measured similarly, but using as a base the annual average of deaths between 1697 and 1708. The regional spread of mortality in 1709-10 was quite different than in 1693-4.¹² This time central France was hardest hit, and much of the southwest less affected than before. The west of France, less dependent on wheat, escaped most lightly, as it had also done in 1649-52 and in 1660-2 (compare Goubert: 1965, 470; Croix, 1981: 323-45).

Second, the prices used here refer to one or two towns in a *département*, while the demographic data refer to the *département* as a whole. Given the high correlations found by Weir (1989) between price movements in towns within a fifty-mile radius of each other, this is not a grave shortcoming. A third shortcoming is that some of the price data refer to calendar years, while others refer to harvest years.

Bearing in mind these weaknesses of the data, was there any relation between prices and mortality? We estimated the proportionate price increases as the difference between price during the famine years (1693-4 and 1709) and the average mortality in preceding years (1680-91 and 1700-7). The outcome of regressing the change in mortality on the change in prices is given in Table 3. The contrast between the significant impact of prices on mortality in the 1690s and the absence of such an effect in 1709 is the most striking outcome. On reflection, this should not come as such a surprise. During the first quarter of 1709 the weather in Northern Europe was colder than at any other time during the Little Ice Age -- cold enough to make all France's rivers, and even the sea at Marseille and Sète, freeze over. *Le grand hiver* almost certainly had a distinctive impact on

the death rate, quite apart from any caused by a poor harvest. The freezing temperatures may well have increased mortality in areas where food was less scarce and its price low relative to elsewhere.

CONCLUSION:

Our calculations offer tempered support for the La Michodière's 'law'. There was indeed a positive correlation between corn prices and mortality in the early eighteenth-century France. However, even then it was weaker and less mechanical than implied by some of La Michodière's successors.

TABLE 1. THE IMPACT OF CHANGES IN THE PRICE OF WHEAT ON MORTALITY

	<i>Paris</i>	<i>Montferrand</i>	<i>Lyons</i>	<i>London</i>
<i>First Differences</i>	49.8 (2.39)	16.83 (1.74)	39.12 (2.62)	2118.7 (1.35)
Prob > F	0.022	0.091	0.013	0.185
<i>Prop. rates of change</i>	0.171 (2.52)	0.349 (1.67)	0.121 (2.16)	0.141 (1.25)
Prob > F	0.016	0.103	0.037	0.217

TABLE 2. MORBIDITY, MORTALITY, AND PRICE IN PARIS AND LYONS 1724-63

	<i>A. The impact of morbidity on mortality</i>		<i>B. The impact of price on morbidity</i>	
	<i>Paris</i>	<i>Lyons</i>	<i>Paris</i>	<i>Lyons</i>
<i>First differences</i>	0.242 (2.52)	0.103 (7.21)	177.4 (2.81)	788.1 (2.96)
Prob > F	0.000	0.000	0.008	0.005
<i>Prop. Rate of change</i>	1.117 (8.41)	1.141 (6.51)	0.127 (2.59)	0.244 (2.48)
Prob > F	0.000	0.000	0.014	0.018

Table 3. PRICE AND MORTALITY IN CROSS-SECTION, 1693-4 AND 1709

	[a]	[b]	[c]	[d]
DPR	0.919 (3.34)	0.871 (3.03)	-0.035 (-0.04)	0.081 (0.11)
CV	4.96 (2.47)		-3.19 (-0.45)	
N	43	43	44	44
Adjusted R ²	0.2534	0.1594	-0.043	-0.024

Note: t-statistics in parentheses.

APPENDIX 1: SUMMARY OF THE DATA FROM *RÉFLEXIONS*:

Variable	Obs	Mean	Std. Dev.	Min	Max
-----+					
Paris:					
ill	40	21081.0	2676.9	15819	27361
dead	40	4725.0	905.9	3148	7894
price	40	18.33	5.71125	11.75	37
Clermond-Ferrand:					
dead	40	590.3	116.87	359	807
price	40	11.6	2.857	6.6	18.4
Lyons:					
ill	40	11520.1	2145.5	7852	16013
dead	40	1000.2	184.5	627	1547
price	40	4.180	.8463	3.275	6.825
London:					
deaths	40	25779	2933.8	19276	32169
price	40	1.923	.3327	1.27	2.7

APPENDIX 2. *Towns/Departments included in the cross-section regressions.*

<i>Town</i>	<i>Département</i>
Bourg-en-Bresse	Ain
Annonay	Ardèche
Aubenas	Ardèche
Charleville	Ardenne
Pamiers	Ariège
Strasbourg	Bas-Rhin
Aix	Bouches-du-Rhône
Arles	Bouches-du-Rhône
Hôtels Dieu Bayeux	Calvados
Bayeux	Calvados
Angoulême	Charente-Maritime
Saint-Brieuc	Côtes-du-Nord
Perigueux	Dordogne
Buis-les-baronies	Drome
Romans	Drome
Chartres	Eure-et-loire
Chateaudun	Eure-et-loire
Pont-St-Esprit	Gard
Grenade-sur-Garonne	Haute Garonne
Toulouse	Haute Garonne
Beziers	Herault
Rennes	Ille-et-Vilaine
Montbatzon	Indre-et-Loire
Tours	Indre-et-Loire
Grenoble	Isère
Boen	Loire
Saint Étienne	Loire
Angers	Maine-et-Loire
Coutances	Manche
Langres	Marne-the
Laval	Mayenne
Douai	Nord
Lille	Nord
Beauvais	Oise
Chaumont	Oise
Lyon	Rhône
Paris	Seine
Rozoy-en-Brie	Seine-et-Marne
Pontoise	Seine-et-Oise
Abbeville	Somme
Montdidier	Somme
Albi	Tarn
Montauban	Tarn-et-Garonne
Draguignan	Var
Poitiers	Vienne
Limoges	Haute Vienne

REFERENCES:

- Biraben, Jean-Noel, Didier Blanchet, and Alain Blum (1988). 'Le mouvement de la population', in Dupâquier (1988), vol. 2, pp. 145-174.
- Bonneuil, Noël (1998). 'Traitement des données manquantes dans les séries issues des registres paroissiaux', *Population*, 53(1-2), 249-270.
- Brian, Éric and Christine Théré (1998). 'Fortune et infortunes de Louis Messance (2 janvier 1734-19 avril 1796)', *Population*, vol. 53(1-2), 45-70.
- Bru, Bernard (1988). 'Estimations laplaciennes. Un exemple: la recherche de la population d'un grand empire, 1785-1812', *Journal de la Société de Statistique de Paris*, Vol. 129(1-2): 6-45.
- Cabourdin, Guy (1988). 'Qu'est-ce qu'une crise?', in Dupâquier *et al.* (1988), pp. 175-91.
- Cabourdin, Guy, Jean-Noel Biraben, and Alain Blum (1988). 'Les crises démographiques', in Dupâquier (1988), vol. 2, pp. 175-219.
- Coquelin, Charles (1852). *Dictionnaire d'économie politique*, 2 vols., Paris.
- Coury, Charles (1969). *L'hôtel-dieu de Paris: treize siècles de soin, d'enseignement et de recherche*, Paris: L'expansion.
- Croix, Alain (1981). *La Bretagne aux 16e et 17e siècles*, Paris: Maloine.
- Dupâquier, Jacques (1979). *La population française aux XVIIe et XVIIIe siècles*, Paris: Presses Universitaires de France.
- et al. (1988). *Histoire de la population française: 2 – De la Renaissance à 1789*, Paris: Presses Universitaires de France.
- Goubert, Pierre (1965). 'Recent theories and research in French population between 1500 and 1700', in D.V. Glass and D.E.C. Eversley (eds.), *Population in History: Essays in Historical Demography*, London: Arnold, pp. 457-73.
- Grantham, George W. (1997). 'Espaces privilégiés: productivité agraire et zone d'approvisionnement des villes dans l'Europe préindustrielle', *Annales E.S.C.* 52(3), 695-725.
- Lachiver, Marcel (1991). *Les années de la misère: la famine au temps du grand roi*, Paris: Fayard.
- Lee, Ronald D. (1981). 'Short-term variation; vital rates, prices and weather', in Wrigley and Schofield (1981), pp. 356-401.

- Malthus, T.R. (1800). *An Investigation of the Cause of the Present High Cost of Provisions*, London.
- Messance, L. (1766). *Recherches sur la population des généralités d'Auvergne, de Lyon, et de Rouen et de quelques provinces et villes du royaume*. Paris: Durand.
- Messance, L. (1788). *Nouvelles Recherches sur la Population de la France*, Lyons : Frères Perisse.
- Meuvret, Jean (1946). 'Les crises de subsistances et la démographie de la France d'Ancien régime', *Population*, n° 4, reprinted in *Etudes d'histoire économique*, Paris, 1971, pp. 271-278.
- Ó Gráda, C. and Jean-Michel Chevet (2000). 'Market segmentation and famine in ancien régime France', available at <http://www.ucd.ie/~economic/workingpapers/2000.htm>
- (2002). 'Market and famine in ancient régime France', *Journal of Economic History*, 62(3) Sept. 2002, 706-733.
- Perrot, Jean-Claude (1988). 'Les économistes, les philosophes et la population', in Jacques Dupâquier (ed.), *Histoire de la population française, vol. 2*, Paris: Presses Universitaires de France, pp. 499-551.
- Schumpeter, J.A. (1954). *History of Economic Analysis*, Oxford: Oxford University Press.
- Smith, Adam (1776 [1976]). *Inquiry into the Nature and Causes of the Wealth of Nations*, Oxford: Oxford University Press.
- Spengler, Joseph (1940). 'Messance: founder of French demography', *Human Biology*, no. 1, February, 77-94.
- Weir, David (1985). 'Life under pressure : France and England 1670-1870', *Journal of Economic History*, vol. 44.
- (1989). 'Markets and mortality in France, 1600-1789', in John Walter and Roger Schofield, eds., *Famine, Disease and the Social Order in Early Modern Society*, Cambridge: Cambridge University Press, pp. 201-34.
- Wrigley E.A. and R.S. Schofield (1981). *The Population History of England 1539-1870*, London : Edward Arnold.
- Tourelle, Jean-Claude (ed.) (n.d.). Transcription of 'Reforme de l'hôtel-dieu à Paris (c. 1749)', available at <http://hypo.ge-dip.etat-ge.ch/www/cliotexte/sites/Arisitum/cdf/hotel.html>

ENDNOTES

¹ Though curiously overlooked by J.A. Schumpeter (1954).

² For an excellent recent appraisal of his career and work see Brian and Théré (1998). See also Bru (1988).

³ Modern research corroborates Messance. According to Dupâquier (1979: 34, 98) France's population rose from 21.5 million in 1700 to 23.8 million in 1730 and 26.9 million in the early 1760s.

⁴ Letter from Adam Smith to David Hailes, 15 January 1769, cited in Smith (1976 : 216, fn19).

⁵ It seems worth noting that the polemical tone of the '*Des Réflexions*' is not anticipated in Messance's preface to *Recherches*, where Messance notes that the price of wheat had fallen in both France and England during the previous century, but 'leaves it to the reader to judge the advantage that may result for both nations'.

⁶ If markets were very closely integrated, in the sense that there was rapid adjustment to spatial disequilibria, the expected correlation between price and mortality would be less.

⁷ For more on these famines see Lachiver (1991) and Ó Gráda and Chevet (2002).

⁸ Our thanks to INED and particularly to Alain Blum for providing us with these data. The dataset used here is an improvement on that used in Cabourdin *et al.* (1988: Figs. 69-72), which lacked information on several départements.

⁹ In their contribution to *Histoire de la population française* in 1988 the leaders of the INED enquête noted the provisional status of their data, but doubted whether further refinement would modify the general outlines (Biraben, Blanchet, and Blum: 1988: 145-6). Of the three series in the database – baptisms, marriages, and burials – the last is

almost certainly the least reliable (Biraben et al., 1988: 151). Still, Cabourdin, Biraben, and Blum (1988: 208) write: *‘on peut mieux définir la géographie de cette crise, les données étant pratiquement complète à cette époque.’* And they reproduce data by département (Figs. 69-72). Internal migration data are lacking, however.

¹⁰ Allier, Ariège, Indre, Landes, Haute-Loire, Lot, Hautes-Pyrénées, Pyrénées-Orientales, Var. Appendix 1 of Ó Gráda and Chevet (2000) offers a few examples from the 1700s of the data at their most problematic.

¹¹ However, the data for Nord seem particularly shaky.

¹² The correlation between estimated excess death rates across départements is only 0.12.